

# Frequency of Fracture of Hyoid Bone in Various Modalities of Strangulation of Neck (Hanging, Garroting and Throttling) in tertiary care facility

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## ABSTRACT

**Aim:** To determine the frequency of fracture of hyoid bone in various modalities of strangulation of neck (hanging, garroting and throttling) in tertiary care facility. Study Design: Cross-sectional study. Setting: Department of Forensic Medicine, Multan Medical & Dental College, Multan.

**Duration of study:** For a period of 10 months from February 2015 to December 2015.

**Methodology:** A total of 135 cases were included in this study. The standardized autopsy procedure was done on every dead body. After observing all the related findings to hanging, ligature strangulation or throttling, the hyoid bone was dissected out for the detection of fracture.

**Results:** Mean age of the cases was  $25.5 \pm 15.9$  years. Out of 135 cases, 79 (58.5%) were male and 56 (41.5%) were female. Modalities of strangulation of neck as follows: 109 cases (80.7%) of hanging, 14 cases (10.3%) of garroting and 12 cases (9.0%) of throttling. Hyoid bone fracture found in 16 cases. Out of these 16 cases, 10.4% fractures were in single piece while 1.5% fractures were in multiple pieces.

**Conclusion:** The fracture of hyoid bone is rare. This suggests that the fracture of neck structures may be present in hanging cases and it is not essentially a feature of hanging.

**Keywords:** Fracture of hyoid bone, Strangulation of neck, Garroting, Throttling

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## INTRODUCTION

The hyoid is the U-shaped bone of the neck that is fractured in one-third of all homicides by strangulation. On this basis, postmortem detection of hyoid fracture is relevant to the diagnosis of strangulation<sup>1</sup>. Fractures of the hyoid bone are known to occur in 17-71% of fatalities following manual strangulation, but are infrequently recognized in survivors<sup>2</sup>. When any case of hanging, strangulation or throttling comes to the Department of Forensic Medicine for Post-mortem examination, the hyoid bone becomes the most integral part of internal examination at the autopsy table. Some have claimed hyoid bone fracture in about 20% cases of hanging<sup>3</sup>. Some have claimed hyoid bone fracture in about 68% cases of hanging. They also claimed that hyoid bone fracture increases with age above 40 years due to calcification and immobilization of joints<sup>4</sup>. Some also claimed that hyoid bone fracture increases with using hard ligature for hanging and strangulation. Fracture of hyoid bone has been ascribed to many factors like manners of constriction, level of application of ligature or force of constriction, long drop or short drop suspension, age of victim, sex of victim etc<sup>5</sup>.

If an incomplete hyoid is found associated with a skeleton, incomplete ossification should first be considered. If the separated margins are clearly irregular and broken, they should be carefully examined for indications of postmortem fracture. If postmortem fracture can be ruled out, inspection for ante mortem fracture (which would show remodeling around a broken surface) is in order. Note that ante mortem or immediate postmortem fracture can almost never be ruled out entirely on skeletal evidence alone. If per mortem fracture is suspected then the nature of the fracture may provide some clues regarding the force applied. Statistically, the fracture most strongly suggests manual strangulation, but other forms cannot be ruled out<sup>5</sup>.

## METHODOLOGY

Anticipated proportion of hyoid bone fracture 14.7%<sup>6</sup>, confidence level 95%, d=6%, n=135. Both male and female cases of neck strangulation were included in the study.

The victims in whom the dead body is damaged by burn or drowning as the findings in the region of neck are obscured were excluded from the study. The cases of burn or drowning were diagnosed on the history and autopsy findings. Study was initiated after taking approval from institutional ethical committee. 135 cases fulfilling including criteria were

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received through Department of Forensic Medicine, Multan Medical & Dental College, Multan. Demographic data i.e., age and sex was recorded. The standardized autopsy procedure was done on every dead body included in the study. After observing all the related findings to hanging, ligature strangulation or throttling, whatever the case may be, the hyoid bone was dissected out for the detection of fracture. The data/findings observed in all cases were incorporated in tabular form. All the information was collected on especially designed proforma. All the collected data was entered into SPSS version 10 and analyzed.

## RESULTS

The detail of results is given in tables 1,2 and 3

Table 1: Modalities of strangulation of neck

Modalities	n	%age
Hanging	109	80.7
Garroting	14	10.3
Throttling	12	09.0
Total	135	100.0

Table 2: Hyoid bone fracture

Hyoid bone fracture	n	%age
Single piece	14	10.4
Multiple pieces	02	01.5
No fracture	119	88.1
Total	135	100.0

Table 3: Modalities of strangulation of neck and fracture with gender

Modalities	Male		Female		Total	
	n	Fracture	n	Fracture	n	Fracture
Hanging	69	1	40	0	109	1
Garroting	5	3	09	2	14	5
Throttling	5	4	07	6	12	10
Total	79	8	56	8	135	16

## DISCUSSION

In present study hyoid bone fracture in various modalities of strangulation of neck was found to be 11.9%. Our results are comparable with a study carried out by Kaheri et al<sup>6</sup> while other two studies demonstrated 25% and 68%<sup>7,8</sup>. Out of 33 cases of hanging fracture of hyoid bone was reported in 3 cases, who were above 40 and in whom hard ligature was used<sup>9</sup>.

In a study conducted in Northern Ireland upon the hanging over a period of five year shows that 105 out of 110 cases were suicidal and rest 5 were accidental. The ligature mark usually crossed the neck over the thyroid cartilage and only seven out of 110 cases it was below the thyroid cartilage. As per their review bruising of the neck muscles were rare (2.9%), 26.7% & 34.3% with hyoid bone and thyroid cartilage fracture respectively. Thus one or more of the neck cartilages was fractured in 47 cases (44.8%). Of the 47 people in whom a fracture observed, 22 were under the age of 40 years and 25 over. A fracture of cervical spine is rare because it requires a 'drop' of some five feet or more. However there was one case in this series. Among the five accidental hanging encountered in this study 4 were children<sup>10</sup>.

In present study, males were 58.5% and females were 41.5%, these findings are consistent with the study of Uzun et al where 537 of those (70.56%) were male and 224(29.44%) were female<sup>11</sup>.

A study of suicidal hangings was made on 175 cases (133 male victims, 42 female victims) for a 5-year period. The mean age was 47.33±17.51 years. The sample was divided in 4 groups according to the position of the ligature knot (anterior, right, left, and posterior hanging). The authors analyzed all visible injuries of soft tissues and bones and cartilage of the neck, and in 150 cases (85.7%), they established that there was at least one injury of these structures (hematoma or fracture for example). The most frequent injury was to sternocleidomastoid muscles. Fracture of throat skeleton was detected in 119 cases (68%). The proportion of fractures increases with age of the deceased. There was no clear correlation between frequency of neck injuries and type of hanging<sup>8</sup>.

According to a study carried out by Feigin (1999), of the 307 cases, 275 were male and 42 were female. Fractures of the hyoid bone, thyroid cartilage and cervical vertebrae were found in 29 of these cases; 4 in females (9.5%) and 25(9.1%) males. Of the fracture observed, 21 were of the thyroid cartilage, 10 were of the hyoid bone, and 3 were of the cervical spine. Of the thyroid cartilage fractures, 20 were of the greater horn, and one was of the lower quarter. Of the hyoid fractures, 11 were lateral, and 1 had no description regarding location. The 3 cervical spine fractures located at C1-2, C3-4 and C6-7<sup>12</sup>.

The number of male cases are 58.5% and of female is 41.5% which is consistent with the study conducted by Uzun et al<sup>11</sup>, where 537 cases were

studied and out of which 70.56% of them were males and 29.44% were females. The slight high percentage with female incline in present study is ought to be due to attire. In Pakistan, the females use to wear shalwar having waistband and suit up dupatta, explaining the slight high percentage of female causalities in present study due to readily available ligature material in the form of waistband, shalwar and dupatta.

Regarding modalities of strangulation, It is observed that 80.7% cases of hanging, 10.3% cases of garroting and 09.0% are of throttling. These findings are consistent with the study conducted by Sharma et al<sup>13</sup>. The literature strongly suggests that hyoid bone fracture is uniformly rare in infants and children and become more likely with advancing adult age as mentioned by Maples et al<sup>4</sup>. 71 males are studied and hyoid bone fracture is seen in 08 cases, while regarding females, hyoid bone fracture is seen in 08 cases out of 48. The present study slightly differ with respect to females, from the study conducted by Feigin<sup>12</sup>, in which he demonstrated hyoid fracture in 29 males and 4 females out of 275 males and 42 females respectively. This slight preponderance towards females in present study deem to be due to male dominating society with the brutal behavior towards females especially in low socioeconomic status. Secondly, frequently available ligature material like dupatta and waistband being the part and parcel of female attire also contribute towards this slight deviation.

Total number of hanging cases as 109 with only one fractured hyoid, while for garroting total number of cases are 14 and 5 of them are having fracture of hyoid bone. For throttling, 12 cases are studied and 10 of them demonstrated fracture of hyoid bone. These results of present study are in accordance with the results of Kumar NS<sup>5</sup>, in which he was unable to detect fracture in hanging cases, while 3 out of 7 ligature strangulation and 4 out of 5 manual strangulation cases showed fracture of hyoid bone.

## CONCLUSION

Fracture of hyoid bone is rare. This suggest that the fracture of neck structures may be present in hanging

cases and it is not necessarily a feature of hanging. The fracture itself is not a life threatening one; it indicates the amount of constricting force inflicted to the neck. But this is highly misunderstood by the investigating authority that fracture of hyoid bone is must in hanging, trotting and garroting.

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